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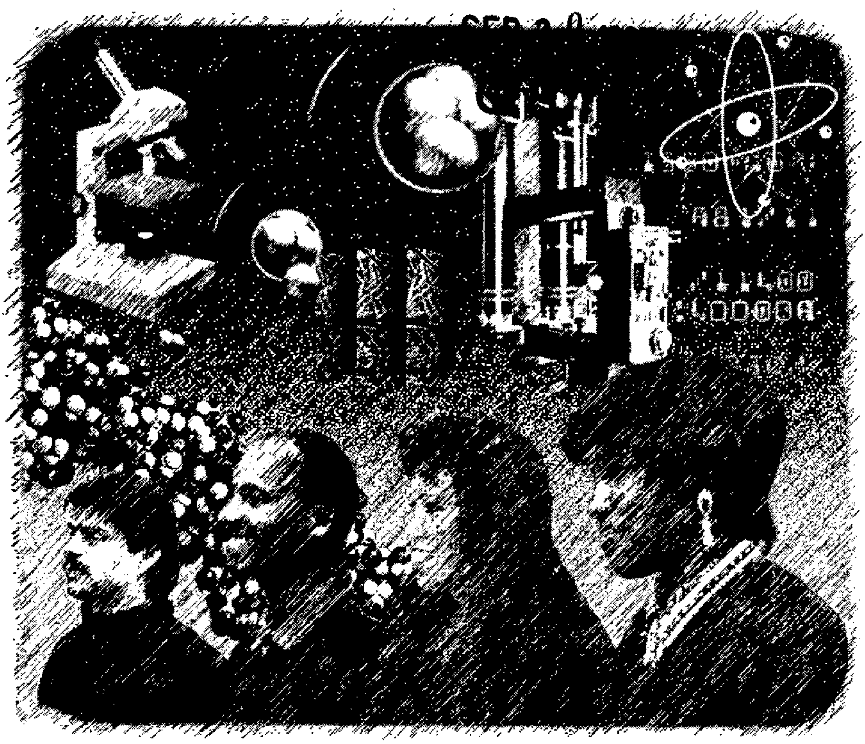
U.S. Department of Energy Student Research Participation Programs

Underrepresented Minorities in U.S. Department of Energy Student Research Participation Programs

March 1996



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Preface

This study of the U.S. Department of Energy (DOE) undergraduate and graduate research participation programs was sponsored by the U.S. Department of Energy's Office of Science Education Programs (OSEP), as a part of the data management and analysis activities associated with program operations. OSEP, directed by William A. Lewis, Jr., sponsored research participation appointments and science education activities at DOE research facilities for faculty and students at the graduate, undergraduate, and precollege levels. Early in FY 1996, the Office of Energy Research assumed responsibility for all programs previously administered by OSEP.

Acknowledgments

This study could not have been completed without the help of many people. Staff members from DOE contractor facilities that host the program participants provided names and addresses of former participants. The American Institutes for Research provided useful guidance in the data-gathering procedures.

The former participants who provided information about their experiences are due a special note of thanks, particularly those who took the time to participate in the focus groups. Without the candid responses provided by these individuals, the study would not have been possible.

Report Highlights

The purpose of this study was to identify those particular aspects of U.S. Department of Energy (DOE) research participation programs for undergraduate and graduate students that are most associated with attracting and benefiting underrepresented minority students and encouraging them to pursue careers in science, engineering, and technology. A survey of selected former underrepresented minority participants, focus group analysis, and critical incident analysis serve as the data sources for this report.

Data collected from underrepresented minority participants indicate that concerns expressed and suggestions made for conducting student research programs at DOE contractor facilities are not remarkably different from those made by all participants involved in such student research participation programs. With the exception of specific suggestions regarding recruitment, the findings summarized in this report can be interpreted to apply to all student research participants in DOE national laboratories. Clearly defined assignments, a close mentor-student association, good communication, and an opportunity to interact with other participants and staff are those characteristics that enhance any educational program and have positive impacts on career development.

Analysis of information collected from selected underrepresented minority participants who participated in DOE research participation programs from 1989 to 1994 resulted in the following suggestions by these former participants.

1. Unique recruiting strategies should be used to reach potential minority research participants. These strategies might include using former participants as recruiters, mailing recruitment materials to offices and student groups focused on minority affairs, contacting individual professors who conduct research in collaboration with the DOE laboratories, and making use of innovative Internet and World-Wide Web communications.

2. The importance of the scientific mentor to the success of programs was frequently emphasized by past participants. Early and direct communication with participants, including a clear description of their research assignment, should be encouraged as a first step in establishing a strong mentor relationship. The mentor's role should be fully understood by those who accept the responsibility.

3. Undergraduates who participate in DOE programs should be provided with opportunities to associate, both socially and professionally, with graduate students and postgraduate researchers so that they can gain a better understanding of the education and career paths that lead to becoming research scientists. It is also important for students to associate with each other.

4. DOE laboratory education offices should make early efforts to acquaint the students with the facility and surrounding community. This can be accomplished through lab tours or by mailing local area maps or visitor brochures to the participants prior to their arrival. It is important to help familiarize students with their local surroundings, and special efforts should be made to ensure that this occurs.

5. DOE laboratory education offices should assist in locating living quarters that are suitable for the participants. A preference questionnaire completed prior to arrival is one means of obtaining information to facilitate providing good housing options. This is typically done for large groups of students, but special care should be taken on an individual basis if necessary.

Section 1
Introduction and Background

The U. S. Department of Energy (DOE) sponsors educational programs that involve college-level students in research participation experiences working with scientists at the DOE national laboratories. These programs are open to all qualified students, and there typically are more applicants than openings in such programs. It has been difficult, however, to attract participants who are underrepresented in science, engineering, and technology.

The purposes of this report are to review the current programs at the undergraduate and graduate student levels and to describe aspects of the programmatic delivery systems that best meet the challenges of attracting minority students to DOE educational programs and subsequently encouraging them to pursue careers in science and technology. The primary source of information in this study is a group of former participants who shared their experiences through survey responses and a focus group meeting that used the critical incident technique to gather data about participants' experiences. The data collection processes focused on the identification of activities or functions that promote student interest in scientific career tracks.

Programs Under Review

Programs conducted at DOE national laboratories for both undergraduates and graduate students are the focus of this study. In recognition of the important role that hands-on research experience plays in the career development of undergraduate and graduate students in science and engineering, the U.S. Department of Energy Student Research Participation (SRP) program was instituted in 1962 to encourage undergraduate students to seek advanced degrees in scientific areas of interest to DOE. The Science and Engineering Research Semester (SERS) program began in 1987. In addition, graduate student programs have been a part of the DOE and its predecessor agencies since their inception.

All of these programs provide undergraduate and graduate students with the hands-on training in energy-related research areas, often allowing them to use equipment not available on their college and university campuses. Students participate in research projects under the guidance of a DOE facility staff scientist. The following paragraphs provide descriptions of DOE national laboratory student programs.

Student Research Participation Program

The Student Research Participation (SRP) program contributes significantly to the training of scientists and engineers in fields relevant to

DOE's mission by providing qualified undergraduate science and engineering students the opportunity to participate in research, development, and demonstration programs at approved DOE laboratories or energy technology centers. Students typically must have completed their sophomore year, but not more than their first year of graduate study in order to be eligible. The 10-week appointments provide a valuable learning opportunity, as well as practical experience to students who work as part of a laboratory research team at the frontiers of science. Assignments are carefully selected and monitored to assure they are meaningful and at an appropriate professional level. Thus, the SRP program enables students to enhance their education and encourages them to work toward higher degrees in fields of interest to DOE. Currently, about 500 students per year are supported in summer programs at over 30 DOE laboratories and contractor facilities.

Science and Engineering Research Semester Program

The Science and Engineering Research Semester (SERS) program provides unique research opportunities for upper-level undergraduate students at the following six national laboratories, which have established Science Education Centers: Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest Laboratory.

At each Science Education Center, SERS participants have the opportunity to become involved in hands-on research by working with scientific teams engaged in long-range investigations and using advanced technologies. SERS research opportunities are available in biomedicine, chemistry, materials science, engineering, physics, environmental science, geoscience, mathematics, computer science, artificial intelligence, energy systems, and waste technology. The program typically places approximately 150 undergraduates per semester at DOE contractor facilities.

Laboratory Graduate Research Participation Program

The DOE Laboratory Graduate (Lab Grad) Research Participation program is an important component of the University/DOE Laboratory Cooperative Program. The program enables graduate students to conduct thesis or dissertation research in residence at a DOE facility. Participants work with laboratory scientific staff and are able to use equipment and facilities not generally available on campuses. Research projects must complement ongoing efforts at the host facilities and must meet students' graduate program degree requirements.

The Lab Grad program supports full-time graduate students enrolled in accredited universities. Appointments are generally for one year, renewable for a maximum of three years for Ph.D. candidates. All academic coursework required for the student's degree except the research are normally completed prior to starting an appointment. Participating students work under the joint direction of a laboratory staff member and a university faculty research advisor who periodically visits the facility to monitor the student's progress. Careful preplanning assures that the research project meets the interests and needs of the student, the cooperating university, and the host laboratory facility.

The Lab Grad program provides a mechanism for transferring the results of federally funded research and development programs into educational experiences for participating graduate students. More specifically, the program is operated with the following objectives in mind: (1) to provide research opportunities at DOE laboratories and technology centers for a diverse group of graduate students, (2) to support students who are completing graduate degrees in disciplines and specialty areas of interest to DOE, and (3) to encourage graduate students to pursue careers and to continue working in areas supportive of the DOE mission. The Department of Energy supports about 200 Lab Grad appointments each year.

Organization of the Report

To gain information about the programs and the delivery systems, a number of data-gathering procedures were employed. The remainder of this report is organized as follows:

Section 2. Methodology and Data Collection Procedures

Section 3. Results of the Survey of Underrepresented Minority Participants

Section 4. Critical Incident Technique Results

Section 5. Focus Group Results

Section 6. Summary

Section 2
Methodology and Data Collection Procedures

The purpose of this follow-up study is to gather information from underrepresented minority participants about the impacts of DOE educational programs on their subsequent educational accomplishments, career aspirations, and professional activities. The intent is to use the collective experiences and perspectives of participants to describe a realistic, cost-effective program model for recruiting, mentoring, and encouraging more participants from underrepresented groups to pursue careers in science, engineering, and technology.

There are many factors that combine to affect the selection and retention of minorities in science. Access, recruitment, mentoring, and program delivery systems are all key factors. These are, therefore, the focus of this study.

Methodology

Major DOE laboratories and facilities were requested to submit names of underrepresented minority students in undergraduate and graduate DOE research programs between 1989 and 1994. Sixteen facilities were contacted on November 11, 1994 and asked to submit names for a total of 100 former participants. Details of the request are included in Appendix E of this report.

During the period 1989 through 1994, the total number of participants in national, DOE-sponsored research participation programs was about 6,500 students, of whom about three-fourths were undergraduates. Over 10 percent of these undergraduates were from groups underrepresented in science and engineering. Almost 5 percent of the students in the graduate research participation programs were from these underrepresented groups. Therefore, approximately 600 minority students participated during this time period. DOE facilities provided the names and addresses of 89 former minority participants. These participants were mailed a survey (see Appendix A) to which 65 responded. The 65 respondents therefore comprise about 11 percent of the population of underrepresented minority students who participated in the DOE programs between 1989 and 1994. The results of the survey are reported in Section 3. A profile of the respondents is included in Appendix B.

To gain further insight into the participants' experiences, focus groups were conducted with survey respondents who were purposefully selected by region. Three separate focus groups were conducted in three different cities. The Atlanta focus group had 7 participants. The Phoenix focus group had 5 participants, and the Chicago focus group had 10 participants. The participants represented a wide range of DOE programs and facilities. The focus group sessions were conducted in an informal manner, and all participants contributed responses.

Twenty-two students, thirteen females and nine males participated in the focus group sessions. Sixteen of the participants, (ten female and six male) were Black. Four participants (two female and two male) were Hispanic. Two participants (one female and one male) were Native Americans.

As a part of the focus group meetings, the critical incident technique, used to collect data about individual perspectives, was used under the direction of a staff member from the American Institutes for Research. This organization has used the procedure under contracts with the U.S. Department of Labor. The technique is described in Section 4 of this report.

Section 3

Results of the Survey of Underrepresented Minority Participants

This section summarizes the information provided by 65 students from the underrepresented minority population who were participants in DOE undergraduate and graduate research participation programs since 1989. The respondents were 20 to 41 years of age; there were more males than females (52 percent versus 48 percent) and the majority of respondents were Black (57 percent). See Appendix B for a profile of the respondents.

The data were collected in a questionnaire that contained previously tested questions used in surveys of similar DOE programs and in large national surveys of college graduates. The questionnaires were mailed to 89 former participants whose names were supplied by major DOE laboratories and facilities hosting these research participation programs. After discounting for 5 bad addresses, the response rate was 77 percent.

The response rate for this survey is higher than for some other studies of former DOE research participants, which may in part be influenced by the relative recency of the participation resulting in fewer out-of-date addresses. Because of the potential for sampling and nonsampling error, due to the methodology used to identify the survey recipients and the survey nonresponse, we cannot be certain that these respondents are representative of the larger population of underrepresented minority participants in DOE programs. While it was not our intent to identify a random sample representative of all past participants, the survey respondents and focus group participants are, however, an important source of information about the program in that they can provide thoughtful objective observations about the programs in which they participated.

An interesting and instructive comparison is to examine how these minority participants compare to other groups of former DOE research participants who responded to similar surveys. Where possible, the respondents in this report will be compared with other former DOE research program participants: 1985 Student Research Participation program (SRP) respondents, of whom only 1 percent were Black and 1 percent were Hispanic, or 1987-1990 Science and Engineering Research Semester (SERS) respondents, of whom 5 percent were Black and 3 percent were Hispanic.

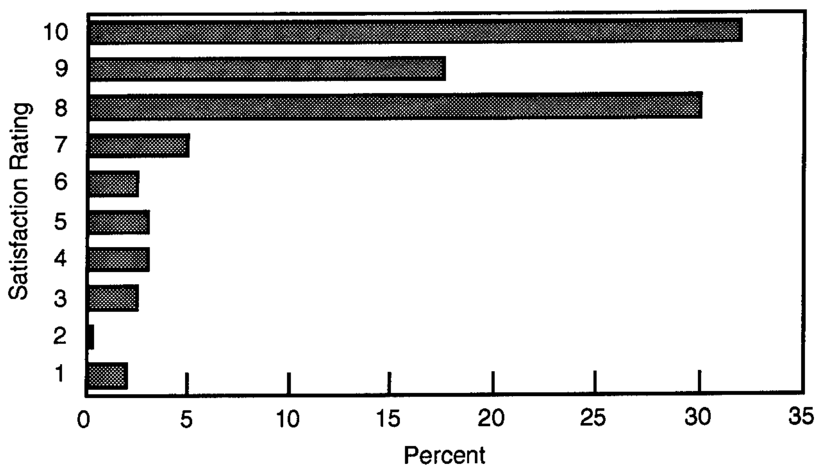
Assessment of DOE Research Programs by Respondents

In addition to questions about general demographics, education, and employment (which are summarized in Appendix B), the underrepresented students were also asked questions about the DOE graduate and undergraduate research programs in which they participated. These questions attempt to gauge the former participants' overall satisfaction with the programs in which they participated, to assess the programs' influence on decisions about school and career, and to determine which program activities were influential for overall satisfaction.

Overall Satisfaction with DOE Research Programs

The 65 underrepresented minority respondents expressed a high level of satisfaction with the programs. On a scale of 1 to 10, with 10 representing very satisfied, 83 percent rated the programs an 8, 9, or 10. The mean response for satisfaction was 8.3. These responses are very similar to data collected from about 270 former Undergraduate Student Research Participants, who gave that program a mean rating of 8.2. (See *U.S. Department of Energy Student Research Participation Program: Profile and Follow-up of 1985 Participants*, September 1994.)

Overall Satisfaction Rating for DOE Research Participation Programs by Survey Respondents



Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Note: Respondents rated the DOE undergraduate and graduate student research programs on a scale of 1 to 10, with 1 representing very dissatisfied and 10 very satisfied.

Influence of DOE Research Programs on Respondents

In addition to indicating their satisfaction with the DOE research programs, the respondents were asked to rate the programs' influence on various important decisions, such as graduate school, occupation, major, and research activities. The results are summarized in the table that follows. The programs were rated as having the least influence on current employer and choice of graduate school; almost 50 percent said the program did not influence these decisions at all. On the other hand, area of specialization and current and past research activities were more strongly influenced by program participation. Also influenced by program participation was the decision to attend graduate school, in which almost two-thirds of the minority respondents indicated the program was of influence to some extent or to a large extent.

In comparison with other SRP participants, these underrepresented minority participants tended to give higher ranking to the programs' influence; however, the areas of influence and less influence were quite similar. (See *U. S. Department of Energy Student Research Participation Program: Profile and Follow-up of 1985 Participants*, September 1994.) The responses of these minority students are also similar to the mean responses of former SERS students on the areas of influence. However, a larger percentage of the minority respondents versus SERS respondents indicated the DOE programs had some to large influence on whether to attend graduate school (64 percent versus 53 percent); area of specialization; (72 percent versus 61 percent); and level of final degree (63 percent versus 47 percent). (See *U. S. Department of Energy Science and Engineering Research Semester: Profile and Survey of 1987-1990 Participants*, July 1991.)

Influence of DOE Research Participation Programs on Survey Respondents

The extent to which participation influenced decision on the following (with 1=Not At All to 4=Large Extent):	Mean Response on 1-4 Scale	Percentage Distribution			
		Not At All	Small Extent	Some Extent	Large Extent
Whether to attend graduate school	2.7	25	11	32	32
Choice of graduate school	2.0	49	19	20	12
Area of specialization	2.9	19	9	37	35
Level of final degree	2.7	22	15	34	29
Current occupation	2.3	37	19	20	24
Current employer	2.1	48	15	12	25
Current and past research activities	2.9	20	13	28	39

Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Note: n's ranged from 59 to 65.

Activities/Opportunities Provided by DOE Research Programs

About 82 percent of the respondents indicated that frequent interaction with a mentor was a part of their program. A large proportion of respondents also indicated they had opportunities to meet other participants regularly and to participate in ongoing research and work as a part of a research team. As far as longer-term aspects of program participation, more than one-half of the respondents indicated they had maintained contact with their supervisor or research colleagues after the program ended. This proportion is high compared with a group of former Student Research Participation program respondents reporting that just over one-third had maintained contact with their supervisor or research colleagues. (*See U. S. Department of Energy Student Research Participation Program: Profile and Follow-up of 1985 Participants*, September 1994.)

Program Activities in Which Survey Respondents Participated

Which of the following were part of the program in which you participated:	Percent
Assistance with housing arrangements	57
Opportunity to meet other participants on a regular basis	71
Organized social activities for program participants	54
A formal series of lectures and seminars	65
Participation in an ongoing research project	71
Opportunity to work as part of a research team	72
Training in the use of sophisticated equipment/instrumentation	68
A formal presentation of your research to laboratory staff	62
Preparation of a paper based on your research	68
Academic credit for participation	28
Frequent interaction with your supervisor	82
Contact with supervisor or research colleagues maintained	52

Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Note: Respondents checked multiple responses; n=65.

Effects of Delivery Systems on Respondents

The respondents participated in both graduate and undergraduate programs, including the SERS program, both Graduate and Undergraduate SRP programs, and the Lab Grad program at DOE facilities. Individual programs and different facilities emphasize various delivery systems to try to accomplish their objectives for the program. The overall satisfaction can be used to examine the effectiveness of the delivery systems. For each delivery system (for example, housing assistance, academic credit, formal series of lectures, etc.), the respondents were divided into two groups depending on whether or not this particular delivery system was a part of their program experience. The mean overall satisfaction was compared for the two groups for each delivery system, and the differences between means were tested for statistical significance. The table that follows summarizes the results of the analysis.

Survey Respondents' Overall Satisfaction with DOE Research Participation Programs as Related to Delivery Systems

Delivery System for Program	Mean Overall Satisfaction Rating for Respondents Indicating System Was: Part of Program	Not Part of Program
Assistance with housing arrangements**	8.8	7.5
Opportunity to meet other participants on a regular basis*	8.6	7.3
Organized social activities for program participants**	8.9	7.4
A formal series of lectures and seminars**	8.8	7.0
Participation in an ongoing research project*	8.5	7.3
Opportunity to work as part of a research team**	8.7	6.8
Training in the use of sophisticated equipment/instrumentation**	8.8	6.9
A formal presentation of your research to laboratory staff	8.4	7.9
Preparation of a paper based on your research*	8.6	7.3
Academic credit for participation	7.5	8.5
Frequent interaction with your supervisor*	8.5	7.0
Contact with supervisor or research colleagues maintained**	9.1	7.2

Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Note: *Two-tailed t-test significant at .10 level.
**Two-tailed t-test significant at .05 level.

It is interesting to note that for all but one delivery system, the mean satisfaction was higher for those respondents in which the delivery system was a part of the program. It seems, therefore, that most all of the delivery systems have positive effects on satisfaction with the DOE research programs. This is true for these underrepresented minority respondents and has been true for other groups of DOE research participants as well. (*See U. S. Department of Energy Student Research Participation Program: Profile and Follow-up of 1985 Participants*, September 1994.) The one exception for this group of underrepresented respondents is "academic credit for participation," in which the 18 respondents who did receive academic credit did not report higher program satisfaction as a group than those who did not receive credit. In any case, the difference is small and not statistically significant.

Many of the delivery systems were associated with significantly higher means for overall satisfaction by respondents for whom these systems were a part of their program. Highly significant were the opportunity to work as part of research teams, training in the use of sophisticated equipment, and formal series of lectures. Also highly significant were delivery systems related to personal interactions: assistance with housing arrangements, organized social activities for program participants, and maintained contact with supervisor and colleagues after program ended.

Participation in ongoing research and preparation of a paper were significant in terms of a higher satisfaction rating as were personal aspects, such as frequent interactions with supervisor and the opportunity to meet other participants regularly.

Section 4

Critical Incident Technique Results

The American Institutes for Research participated in the study by providing guidance in the use of the critical incident technique to collect data about the programs under review. The following is the report of the results using this technique.

Introduction

The critical incident technique is a structured method for gathering qualitative information about behavior in defined situations (Flanagan, 1954). The technique centers around the collection and analysis of instances of behavior, "... that constitute either very effective or very ineffective performance with respect to the activity in which one is interested" (Wilson, 1988, p. 3). These instances are referred to as critical incidents (CIs). The activities of interest in this situation are the delivery systems of DOE programs or other events that happen during program participation. This technique is a valuable addition to the traditional focus group approach because CIs are collected in writing from participants according to a structured format. This method (1) allows individuals to respond in a manner that is less influenced by other participants than is the case in the open discussion of a focus group and (2) provides complete descriptions of situations in a uniform format that facilitates the analysis of the information collected. The rest of this section describes the procedure by which the CIs were collected and analyzed and the results of the analysis. In this context, the goal of the CI workshop was to contribute to the evaluation of DOE laboratory research participation programs by identifying and describing the factors that affect the likelihood that participants will persist in acquiring advanced degrees in science, engineering, or technology.

Procedure

Three CI sessions were conducted; each was a part of the participant focus groups conducted in Atlanta, Chicago, and Phoenix. The sessions included seven, ten, and five former DOE program participants, respectively. The critical incident exercise lasted between two and three and one-half hours.

At the beginning of each workshop, participants read and signed a participant consent form (see Appendix F). This was followed by a statement of the workshop's goal (i.e., collect critical incidents from former participants in DOE educational programs for the purpose of program evaluation). CIs were introduced as small, detailed descriptions of events that took place during a program that positively or negatively affected a participant's ability or motivation to persist in science, engineering, or technology.

Specifically, a CI was described as consisting of five elements:

1. A description of the situation that led up to the incident;
2. A description of what an individual or the laboratory did in response the situation that had a positive or negative effect;
3. A description of the outcome of this action;
4. An evaluation of the action in the form of a rating of a 7-point scale that ranged from -3 (very negative) to +3 (very positive); and
5. An explanation of why the action received a positive or negative rating and a statement about what the individual or laboratory should have done differently.

This explanation of the CI was accompanied by a few examples of critical incidents from other domains and some tips for writing CIs. The tips included the following admonitions: (1) consider your experience with a DOE laboratory, (2) focus on the observable behaviors of individuals or the laboratory, (3) write incidents in the third person, and do not use personally identifying information, (4) keep it concise, and (5) record incidents that happened to you or that you observed directly.

After being introduced to the CI technique, the participants were provided with a critical incident form for recording their incidents that provided space for each of the five elements described above (see Appendix F). After each participant had written one CI, the workshop facilitators reviewed the incidents and addressed any remaining questions. During the remaining time, the participants wrote CIs while the facilitators circulated to help participants describe their incidents in a manner consistent with the format. Each CI included an identification number that indicated the workshop location and uniquely identified it as an incident written by a particular respondent; however, these identification numbers are not associated with the names of the participants.

Results

Across all three workshops, 22 participants wrote 141 CIs with a mean of 6.41 incidents per participant; the following table shows the mean and range of the number of CIs written at each workshop.

Number of CIs by Workshop

	Atlanta	Chicago	Phoenix
Number of Participants	7	10	5
Number of CIs	58	40	43
Mean Number of CIs per Participant	8.29	4.00	8.60
Range of CIs per Participant	5 - 13	1 - 6	3 - 14

After the incidents were collected, they were edited to correct grammar and spelling and to eliminate information in the incident that would identify a particular laboratory or individual. The incidents were then typed into electronic files. This prepared the incidents for sorting.

The incidents were sorted to discover the common factors that program participants feel affected their likelihood to persist in acquiring advanced degrees in science and engineering. A research scientist at the American Institutes for Research with experience in sorting CIs from multiple domains sorted the incidents; this sorting was reviewed and modified by two senior research scientists from the same organization. This procedure resulted in the identification of eight dimensions of the program experience that affect the persistence of its participants. Within each dimension, the positive and negative CIs were separated. The separation of positive and negative incidents was based on the judgment of the research scientist after comparing each incident to the other incidents sorted into the same dimension; this judgment did not always agree with the evaluative rating made by the participant who wrote the incident.

The eight dimensions were organized into four areas. The areas and dimensions are listed in the following table associated with the number of incidents sorted into each dimension.

Results of Sorting CIs Into Dimensions

Area	Dimension	Number of CIs (Positive/Negative)
Training and Development	Mentoring	28/17
	Professional Development/ Communication	13/3
Interactions Affecting Quality of Life	Laboratory Staff	16/10
	Other Students	3/4
	Community	3/2
Program Administration		6/15
Security	Safety	1/6
	Discipline	3/2
Miscellaneous		7/2

It is relevant to note that 80 of the CIs were positive and 61 of the incidents were negative. Overall, the workshop participants were very positive about their experiences; however, the CI procedure included explicit instructions to write negative as well as positive CIs.

Training and Development. More than a third of the CIs are in this area. This result is consistent with a primary goal of the DOE research programs: that is, to help outstanding science and engineering students complete advanced degrees. The incidents in this area refer to events that were aimed at directly affecting a participant's level of preparation in an academic discipline or area of research.

The first dimension in this area is mentoring. Mentoring is defined here as direct one-on-one contact between a program participant and a member of the laboratory staff that involved issues related to participation in a laboratory activity or the student's career preparation. Positive incidents in this dimension included the following themes:

- A staff member met with the student on a regular basis. During these meetings, the staff member made expectations clear and treated the student's questions, comments, and requests with respect.
- A staff member offered specific research or career-related advice in a way that showed that they had confidence in the student. Sometimes this included directing the student to a particular source of information (e.g., another staff member or a research article).
- A staff member managed the student's experience so that assignments were meaningful and challenging, but not too difficult.
- The student damaged a piece of equipment or performed a procedure incorrectly, and a staff member showed the student how to correct the problem in a manner that did not hurt the student's confidence.

Negative incidents in this dimension included the following themes:

- The staff member assigned to the student did not communicate with the student often enough.
- A staff member communicated with the student in a disrespectful manner. These instances included situations during which there was a technical disagreement or the staff member was explaining something to the student.
- A staff member assigned the student to a project that was either too difficult, unimportant, or not interesting.
- A staff member failed to manage the student's experience such that the student did not have enough work to do or was assigned to a project that was poorly planned.
- A staff member failed to give the student credit for the student's contribution to the research.

The second dimension in this area is professional development/communication. This dimension includes formal activities that were designed to help program participants integrate into their professions. Positive incidents in this dimension included the laboratory staff organizing the following activities:

- student participation in professional conferences including the preparation and presentation of posters and papers;
- regular forums for students to gain experience in presenting research;
- regular meetings in which staff present research or lead discussions relating to career development; and
- opportunities for students to take classes or attend training in a particular area during their appointments.

Negative incidents in this dimension related to the failure to organize the forums and meetings discussed above or to provide training in a particular area.

Interactions Affecting Quality of Life. The incidents in this area involve interactions with laboratory staff, other students, or members of the community at large that were viewed by the program participants to have a positive or negative effect, but that were not directly related to technical project issues or the administration of a DOE research program. They primarily dealt with situations in which someone made life easier or more difficult for a program participant.

The first dimension in this area is interactions with laboratory staff. The positive incidents in this dimension represent laboratory staff helping program participants in the following ways:

- accommodating the student's needs relative to the requirements of his/her educational institution (e.g., allowing time off to attend graduation or scheduling the appointment around a quarter system);
- allowing students time off or flexible work hours to accommodate personal and/or family activities;
- making resources available to students such as work space or transportation; and
- helping students adapt to living away from home by assisting students with personal problems or including them in a staff's family activities.

Beyond the failure to provide some of the kinds of help described above, the negative incidents in this dimension did not seem to cluster around any general themes except a very small number that dealt with minority or women's issues. The following are summaries of some of the negative incidents:

- In a meeting, a laboratory staff member left a female minority student with the impression that the laboratory might be encouraging a low acceptance threshold for minority or women program applicants.

- The laboratory did not encourage social interactions among minorities and nonminorities, thus making professional interactions more difficult.
- The laboratory staff advisor gave a female student negative feedback about her choice of clothes in front of other people.

The second dimension in this area is interactions with other students. A relatively small number of incidents were sorted into this dimension. The positive incidents generally dealt with one student helping another or providing a positive example. Most of the negative incidents in this dimension were about the lack of social interactions among program participants; in all of these incidents, it was indicated that the laboratory failed to organize social activities.

The third dimension in this area is interactions with the community. Again, a small number of incidents were sorted into this category. These incidents involved interactions with members of the community surrounding a laboratory's facilities. The positive incidents include acts of kindness or socializing, and the negative incidents involved a difficulty with a police officer and a landlord during a dispute related to a noisy washing machine.

Program Administration. Program administration is defined here as the management of the administrative details associated with a student's participation in a DOE research program. This dimension includes incidents associated with participant living arrangements, the payment of stipends and travel reimbursement, and the procurement of security clearances. Positive incidents in this dimension include the laboratory helping program participants

- find a place to live during the appointment by providing them with lists of addresses and/or matching them with potential roommates,
- obtain training necessary for a security clearance,
- obtain information about access to facilities (e.g., the library), and
- locate missing stipend checks.

Negative incidents in this dimension include administrative problems such as

- placing the program participants in a hotel with no cooking facilities and inadequate laundry facilities,
- delays in issuing stipend and travel reimbursement checks,
- delays in acquiring security clearances, and

- failure to provide participants with important information (e.g., not providing directions to the laboratory).

Security. This is the final area; it includes a small number of incidents in two dimensions. The first is titled discipline; it contains incidents relating to disciplinary actions taken towards program participants. The positive incidents in this dimension describe the successful resolution of a conflict between two students and the positive resolution of two situations in which a student failed to comply with dormitory rules. The second dimension in this area is titled safety. The single positive incident in this dimension describes a program administrator behaving appropriately relative to a participant's health problem. The negative incidents in this dimension describe instances of individuals engaging in unsafe practices in the lab, not thoroughly explaining laboratory safety procedures to students, and making statements that were interpreted as a lax attitude towards safety issues.

Unsorted CIs. Nine incidents were not sorted into any of the eight dimensions. The majority of these incidents were positive. Some of the incidents dealt with a student's experience in an area that convinced the student to change his/her interests. Two of the positive incidents referred to the focus groups the participants were attending when they wrote the incidents. Both negative incidents were from a single workshop participant who wrote about his own behavior.

Summary

As indicated above, the CI technique is a structured method for gathering qualitative information about actions that have a positive or negative effect in a domain of interest. In this context, the focus is on the factors affecting DOE research program participants' likelihood to persist in acquiring advanced degrees in science or engineering. This information was collected in a manner that allowed workshop participants to provide relatively independent responses and resulted in a written record of 141 incidents that former participants felt had a positive or negative effect on their likelihood to persist.

The CIs were sorted by a research scientist into eight dimensions. The dimensions are (1) mentoring, (2) professional development/communication, (3) interactions with laboratory staff, (4) interactions with other students, (5) community, (6) program administration, (7) safety, and (8) discipline. Together these dimensions describe the factors that program participants feel affect persistence.

It is important to note that the numbers of positive and negative incidents sorted into each dimension should **not** be used to make inferences about how important the participants feel each dimension is or about their overall evaluation of their experience in a DOE research program. The number of incidents in a particular dimension most likely reflect only how salient those events are in the participants' memories. If the CI workshop participants were asked to rate the importance of each of the eight dimensions, those ratings might not agree with the relative numbers of incidents sorted into each dimension. Further, the CI technique requests that participants generate both positive and negative incidents independent of their overall evaluation of the experience they are writing about.

The CIs are, however, valuable for the purpose of providing additional detail and substance to evaluative information collected by other means (e.g., surveys and more open-ended focus group techniques). For example, if the survey results suggest that mentoring was a very important and positive part of the program participants' experiences, the CIs associated with that dimension provide detailed descriptions of laboratory staff behaviors that represent positive mentoring. If the content analysis of the information collected during the open-ended focus groups reveals that program participants were unhappy about some aspects of the administration of a program, the incidents provide detailed descriptions of negative program administration events that could be reviewed to discover what went wrong.

Potential Uses of Critical Incidents

CIs are used here to supplement information collected to evaluate DOE educational programs via surveys and focus groups. However, these incidents have a number of other potential uses. For example, summaries of the incidents could be used to develop training or orientation materials for current and potential DOE program advisors and administrators. Selected incidents could be used to develop orientation materials for potential program participants that could include information about potential advantages and disadvantages of the experience. The laboratories could also examine the incidents to identify aspects of their programs that could be improved. For example, the CIs suggest that housing arrangements was an area in which better or different laboratory involvement could have benefited program participants.

Section 5

Focus Group Results

The following summary is based upon discussions that occurred during two-day long focus group meetings of participants in Atlanta, Chicago, and Phoenix. Twenty-two students, thirteen females and nine males, participated in the focus group sessions. Sixteen of the participants, (ten female and six male) were Black. Four participants (two female and two male) were Hispanic. Two participants (one female and one male) were Native Americans. The participant focus groups arrived at many pragmatic recommendations that they believe, based upon their personal experiences, would improve the quality of future participants' appointments. The insights that focus group discussions provided on individuals' experiences fell into categories very similar to those of the CIs described in the previous section: mentor relationships, professional development, research experience, integration into the laboratory environment, and social interactions with other students and staff across programs. In addition, due to DOE's interest in expanding the pool of minority applicants to its laboratory facility programs, focus groups were asked to generate suggestions for improving recruitment efforts.

While the purpose of the focus groups was to garner feedback specifically concerning members of historically underrepresented groups in the sciences, participants' suggestions were very much in line with the results of a body of studies addressing the educational and career development needs of all science, math, and engineering students from academic institutions and similar research programs. The topics that dominated focus group discussions, therefore, do not reflect issues solely relevant to minority student participants.

Mentoring

Focus group participants said that mentors "make or break" a student's experience. Students perceive their advisor's strength as a good mentor to determine whether or not their experience during their laboratory appointments was a success. Participants' emphasis on mentoring is very much in line with current research. Irrespective of student race and gender, the establishment of mentor relationships with practicing scientists appears to further develop students' aspirations for research careers (Carrier & Davis-Van Atta and Franfort, 1985; Garfield, 1987; Valdez & Duran, 1991). Mentor and faculty involvement is especially important for women and minorities. It is the single most significant college factor in determining entry and persistence of minorities and women in the science fields where they are most underrepresented (National Science Foundation, 1994; Levin & Levin, 1991).

Participants concurred about the personal qualities that make for a good mentor. Students agreed that "mentors need to want to advise, to like to teach" and that "clear communication is a must." Mentors communicate to students respect "for their intelligence and as a person" by treating students "as part of team." Students appreciated mentors who encouraged them to attend relevant on- and off-site presentations, classes, and tours and who allowed them to have flexible work schedules. The qualities focus group participants used to depict good mentors are almost identical to those named by science, math, and engineering students when they describe the important elements of good teaching: openness, respect for students, encouragement of discussion, and the sense of discovering things together (Hewitt & Seymour, 1994). The advisors who provide the most rewarding experience for participants, however, function as more than laboratory supervisors. Mentors who welcome discussions about students' academic, career, and personal concerns make the mentor relationship most rewarding for participants.

The majority of focus group participants spoke extremely favorably of their mentors. Good mentors bolstered participants' confidence about their ability to succeed: "Everyone had a lot of confidence in me, and that helped me to say, 'Well, I guess I can do this.' My advisor was key. He really was very patient and he was a great mentor." One participant called his advisor after reading the project description, in which "half of the words I had never encountered before." The student's advisor "seemed to have so much confidence in the fact that I could do this ... He explained that I wasn't just going to show up there ... You're going to ask questions and you're going to learn.'"

Some students, semester-long appointees in particular, desired clearer project structure and guidance in research procedures. Other participants appreciated jointly developing a project to meet their individual interests, thus being "treated like a colleague: Your mentor will give you enough information for you to develop a thinking process. He will just present the problem or say the information is here, so try to develop an approach to solve that problem."

Former participants' ideas for improving the mentor aspect of the program reflected their desire to replicate positive mentor-student relationships. The focus group participants suggested that the laboratories formalize the mentor agreement in order to enhance the overall quality of the mentor selection process. At some facilities, there is a selection process for advisors involving a written project description, and advisors must submit weekly reports. Students agreed that this process, as well as formal participant evaluations of their mentors, should be instituted across sites. Participants also agreed that "mentors should contact students before the program begins, and give a sense of the project" because personal contact would "lessen anxiety" that students that generally experience before commencing the program.

Professional Development

During their appointments, participants developed important writing and presentation skills, as well as general skills, such as learning "to get the job done," which they believe are highly valuable to their academic and professional careers. Some students indicated they would have benefited from structured guidance in learning how to write and conduct research. One laboratory provided this by organizing weekly lectures by scientists and more advanced students about developing presentations. A scientist was also assigned to help students write final research papers and was available to discuss college and career choices. Previous students' papers were bound and kept on file as a resource for current participants. Such measures helped students gain confidence in their ability to develop and present their research.

The program exposes students to the realities and opportunities of a research career. Program participation strengthened several participants' conviction to get a Ph.D: "In the lab I was exposed to the good and bad of being an engineer. I wanted to know if I could succeed in graduate school. Program participation helped me to answer my questions and realize I could do it." For many students, it was their research appointment that convinced them they would be able to successfully complete advanced degrees: "I went into this program wondering, 'Can I make it in graduate school?' For some reason I had this idea that all the people were going to be geniuses, which isn't true at all. It helped me get over that image I had." One participant suggested that undergraduate participants could receive guidance from graduate student participants about being admitted to and succeeding in graduate school.

Learning Through Conducting Research

Career development research clearly indicates that active participation in research is one of the most important factors contributing to recruitment and retention of students in scientific careers (Garfield, 1987; Stanistski, Frankfurt & Muir, 1986). Students actively participating in laboratory experiments in which the outcome is uncertain and in which they themselves contribute to the experimental design are more excited about science and comprehend and retain more concepts than those not involved in such learning situations (Barisa & Holland, 1993). Hands-on laboratory experience and equipment use is particularly important for women and minorities, who often lack experience and confidence in the laboratory. If these students do not acquire exposure early, they will be less likely to continue through the science curriculum (Rosser, 1990; Barisa & Holland, 1993).

In keeping with the above findings, participants consistently referred to the depth of learning that their research experience fostered. "My advisor spent the first week explaining the lab and the robots to me ... I knew very little about robotics before my appointment ... By the end of that first semester I was doing things that I would never have dreamed that I would do. I was using machines I'd never seen before." Students in like-minded undergraduate research programs funded through the National Science Foundation, Minority Access to Research Careers (MARC), and Research Experience for Undergraduates (REU) similarly lauded the opportunity to learn more about their academic field through research experience, as well as increased interest in science and engineering as a career (Fitzsimmons, Carlson, Kerpelman & Stoner, 1990; Stefano & Leung, 1986).

Recruiting

Focus group participants agreed that the best "selling points" of the undergraduate program are the increased academic benefits, employment opportunities, and the professional contacts associated with students' research experiences; the opportunity to work with state-of-the-art equipment and recognized experts in the field; and exposure to a diverse group of people.

Printed promotional materials are the primary means laboratories use to inform students about the program. Focus group participants emphasized the importance of the language used in these materials. Several students indicated that some program's poster descriptions of the program as "highly competitive" "may put people off" because "it looks intimidating." Information about specific projects and lab departments should also be included on applications to further students' interest. The focus groups recommended that promotional fliers be sent directly to professors, especially those involved with DOE contractor facilities because, "Professors take more interest than department chairs. Get information to experienced professors who collaborate with labs." It was also recommended that information be sent to deans of minority affairs, minority organizations, and career offices in order to better target minority student applicants.

According to participants, the most effective way to recruit minority applicants, however, is not through promotional materials, but "by word of mouth." Not only program staff, but student participants should recruit at schools, minority science and engineering conferences, minority organizations, and career fairs. It is the former participants who may best communicate the benefits of their experiences to potential applicants, as well as assuage students' concerns about their abilities to perform well in laboratory research appointments. One student suggested that former participants may be willing to volunteer to discuss the program over the phone with potential applicants.

Quality of Life

Focus group participants made recommendations concerning the quality of life related to both their work and personal lives throughout the duration of their appointments. Quality of life issues were discussed in terms of assimilation into the laboratory environment and the neighboring community, interactions with other students, and housing, transportation, and reimbursement issues.

Assimilation into Laboratory Environment. Research and evaluations of related student training programs have determined that organizing activities and support systems to facilitate students' full incorporation into the lab environment increases their satisfaction with their appointment, expands their access to and perception of available opportunities, and fosters leadership development and social integration with staff and other students (Banta, 1982; Gordon, 1986; Levin & Levin, 1991).

Participants often voiced their desire to have had full tours of the laboratory facilities where they worked. Tours could serve as extremely helpful orientations to the work that occurs on site, which would help student participants feel more connected with the laboratory as a whole. They also voiced a desire to attend on- and off-site presentations relevant to their projects and academic/professional interests. A few students' limited building access interfered with their ability to attend such activities. Seminars, for example, were often held in "secured areas" to which the participants did not have official access. Some laboratories encouraged students to network in various departments, and those students who took advantage of these opportunities found them invaluable.

Several students were surprised by the small proportion of minority staff working at the laboratory facilities. One Black female student explained that in addition to the presence of few minority coworkers, she was the only woman in her building, "so I had those two things to contend with when I got there." Despite her minority status, the student did feel accepted by her coworkers.

Assimilation into Local Community. Several participants found adjusting to the local community, and especially the lack of minority local residents, more difficult than adjusting to the laboratory environment. One student describes the town where she lived during her assignment: "I think there were a total of four Black families living in the area ... I didn't know that it would be like that ... Once I'd adjusted to those kinds of things it was O.K." Students recommended that future participants be made aware of past participants' similar stories, in order to help prepare them for the possible lack of minorities within both the laboratory and local community.

Social Interactions. Some participants voiced a sense of isolation related to students' dispersion in projects across laboratory divisions, and a lack of basic structures to assist them in accessing each other, although some laboratories organized structured social activities for participants. Past participants recommended that all facilities do this, and that social activities be scheduled during evening and weekend hours so that all students would be able to attend. Organized activities would be particularly helpful in the beginning of the summer. One simple means of helping participants connect with each other would be for laboratories to disseminate a listing of participants' names, addresses, program/division assignments, e-mail addresses, and home telephone numbers.

Program Administration: Housing and Transportation. Two program administration issues, transportation and housing, while not directly related to participants' research experience, do affect the quality of their overall experience. These issues are commonly mentioned by other focus groups of student research participants and thus are not unique to minority participants.

Initial travel costs to the laboratory sites were often reimbursed by the laboratory after students' arrival. Two students suggested that this upfront expense was a significant financial burden. Upon arrival, students were often isolated when not at work because they had no available transportation around the community in which the laboratory was located. Some found the lack of transportation difficult in getting to and from the facility and also in getting around the facility from their work site.

Lack of information about housing options upon acceptance, as well as the quality and affordability of the housing available was also discussed. Two students benefited from living with families in the community. They enjoyed this option because it was affordable, gave them increased social contacts of a family, and provided access to transportation to the facility after work and during weekends. Another student believed that housing participants together in a dormitory would provide an important element of cohesion to the group. Others, however, had been provided dormitory-style housing in a nearby hotel, which proved to be expensive and inconvenient since they were unable to prepare their own meals. Participants recommended that, in the case of shared living accommodations, laboratories could appropriately match students with similar concerns (e.g., nonsmoking, native language, access to transportation) based upon a housing questionnaire administered prior to students' arrival on site.

Focus Group Conclusions

The focus group participants voiced overall satisfaction with their appointments. They found independent research to be a challenging and rewarding learning and professional opportunity. The benefits of the program offset any difficulties that might be related to issues of minority status within the laboratory facilities or neighboring communities. The focus groups did, however, develop several concrete suggestions for improving program activities to enhance the experiences of future participants and render the program more attractive to minority students.

Section 6
Summary

Data collected from underrepresented minority participants indicate that concerns expressed and suggestions made for conducting student research programs at DOE contractor facilities are not remarkably different from those made by all participants involved in such student research participation programs. While minority participants who supplied input for this report provided some special information on recruiting and encouraging minority students, the vast majority of the information they provided is useful for managers conducting any student research programs regardless of ethnic background or gender of participants. Clearly defined assignments, a clear mentor-student association, good communication, and an opportunity to interact with other participants and staff are those characteristics that enhance any educational program and can have a positive impact on career development. The findings summarized in this report provide program managers with guidelines to enhance programs, which can result in better recruiting of underrepresented minority participants to DOE research participation programs as well as encouraging them to persist in science, engineering, and technology careers.

Appendix A
Survey Questionnaire

OMB NO. 1910-1400
1995

U.S. DEPARTMENT OF ENERGY
UNDERGRADUATE AND GRADUATE STUDENT
RESEARCH PARTICIPATION PROGRAMS
Participant Tracking and Information Form

Note: All information you provide on this form will be treated as confidential. Information will be released only in statistical summaries or in a way that does not identify information about any particular person. Your response is entirely voluntary, and your failure to provide some or all of the requested information will in no way adversely affect you.

I. GENERAL INFORMATION Date: ______________

1. Your Name: ____
(First) (Middle) (Last)

Permanent Address: ____

______________________________ Zip: ____________
(City) (State)

Permanent Phone: (____) _____ - __________

2. Date of Birth: ______________
(Month/Day/Year)

3. Social Security Number: _____ - _____ - ______

4. Sex: ☐ 1. Male
☐ 2. Female

5. Racial/ethnic background:

☐ 1. American Indian or Alaskan Native

☐ 2. Asian or Pacific Islander

☐ 3. Black, not Hispanic

☐ 4. Caucasian, not Hispanic

☐ 5. Hispanic

6. Citizenship:

☐ 1. U.S. Native Born

☐ 2. U.S. Naturalized

☐ 3. Permanent Resident Alien
citizen of: ______________________

7. At what laboratory did you participate in a DOE research participation program?

____

Year(s) of participation: ______________________

Level: ☐ Graduate ☐ Undergraduate

(please continue)

II. EDUCATIONAL INFORMATION

8. Level of **HIGHEST** degree earned:

   ☐ 1. B.S./B.A.

   ☐ 2. M.S./M.A.

   ☐ 3. Ph.D.

   ☐ 4. Professional degree (e.g., M.D., D.D.S., J.D., etc.)

   ☐ 5. Other, please specify ____________________

   Institution from which **HIGHEST** degree was received and year granted:

   ____ (Institution)   ____________ (Year granted)

9. From the attached Degree and Employment Specialty List, please give the following information for all degrees you have earned. Please write in your degree field if it is not on the list.

   a. Bachelor's degree field:

   ____________ (Number)   ______________________________ (Title of field)

   b. Master's degree field:

   ____________ (Number)   ______________________________ (Title of field)

   c. Doctoral degree field:

   ____________ (Number)   ______________________________ (Title of field)

   d. Professional degree field:

   ____________ (Number)   ______________________________ (Title of field)

   e. Other degree, please specify ____________:

   ____________ (Number)   ______________________________ (Title of field)

10. Do you expect the degree(s) you currently hold to be your **FINAL** degree?

    ☐ 1. Yes
    ☐ 2. No

    a. If NO, what is the **FINAL** degree you anticipate receiving?

       ☐ 1. B.S./B.A.

       ☐ 2. M.S./M.A.

       ☐ 3. Ph.D.

       ☐ 4. Professional degree (e.g., M.D., D.D.S., J.D., etc.)

       ☐ 5. Other, please specify ____________________

    b. In which year do you expect to receive this degree? ____________

    c. From what institution do you expect to receive this degree?

    ____

(please continue)

III. EMPLOYMENT INFORMATION

11. What is your **CURRENT** employment status? (Select only one response.)

- ☐ 1. Employed full-time
- ☐ 2. Employed part-time
- ☐ 3. Postdoctoral appointment
- ☐ 4. Unemployed and seeking employment
- ☐ 5. Unemployed and **NOT** seeking employment
- ☐ 6. Other, please specify ____________________

12. If you are currently **UNEMPLOYED**, what is the most important reason for not working?

- ☐ 1. Student
- ☐ 2. Suitable job not available
- ☐ 3. Constraints due to family or marital status
- ☐ 4. Health or personal reasons
- ☐ 5. Other, please specify ____________________

13. If you are currently employed **PART-TIME**, what is the most important reason for being in part-time status?

- ☐ 1. Student
- ☐ 2. Part-time employment preferred
- ☐ 3. Full-time position not available
- ☐ 4. Other, please specify ____________________

14. From the attached Degree and Employment Specialty List, enter the number and title of the employment specialty most closely related to your **CURRENT** principal employment. Write in your specialty if it is not on the list.

__________ (Number) ______________________________ (Title of field)

(please continue)

15. Which category below best describes your **CURRENT** principal employer?

- ☐ 1. Federal laboratory
- ☐ 2. Business or industry (including self-employment)
- ☐ 3. Junior college, two-year college, technical institute
- ☐ 4. Medical school (including university-affiliated hospital, or medical center)
- ☐ 5. Four-year college or university, other than medical school
- ☐ 6. Elementary or secondary school system
- ☐ 7. Hospital or clinic
- ☐ 8. Nonprofit organization, other than hospital, clinic, or educational institution
- ☐ 9. U.S. military service, active duty, or Commissioned Corps, such as USPHS, NOAA, etc.
- ☐ 10. U.S. Government, civilian employee
- ☐ 11. State government
- ☐ 12. Local or other government
- ☐ 13. International agency
- ☐ 14. Other, please specify ______________________________

16. From the activities listed below, select your primary work activity in your **CURRENT** principal job in terms of time devoted during a typical week.

- ☐ 1. Management or administration of research or development
- ☐ 2. Management or administration of other than research and development
- ☐ 3. Teaching and training--preparing and teaching courses, guiding and counseling students or trainees
- ☐ 4. Basic research--that is, study directed toward gaining scientific knowledge primarily for its own sake
- ☐ 5. Applied research--that is, study directed toward gaining scientific knowledge in an effort to meet a recognized need
- ☐ 6. Development--product, process, and technical development. That is, direction of knowledge gained from research toward production of useful materials, devices, systems, and methods
- ☐ 7. Report and technical writing, editing, information retrieval
- ☐ 8. Clinical diagnosis, psychotherapy
- ☐ 9. Design of equipment, processes, models
- ☐ 10. Quality control, testing, evaluation, or inspection
- ☐ 11. Operations--production, maintenance, construction, installation, exploration
- ☐ 12. Distribution--sales, traffic, purchasing, customer and public relations
- ☐ 13. Statistical work--survey work, forecasting, statistical analysis
- ☐ 14. Consulting
- ☐ 15. Computer applications
- ☐ 16. Other, please specify ______________________________

(please continue)

17. From this list of selected areas of national interest, indicate the **ONE** area to which you devote the **MOST** professional time during a typical week at your **CURRENT** principal job.

- ☐ 1. Energy and fuel
- ☐ 2. Health
- ☐ 3. Environment
- ☐ 4. Education
- ☐ 5. National defense
- ☐ 6. Agriculture
- ☐ 7. Mineral resources
- ☐ 8. Community development and service
- ☐ 9. Housing (planning, design, construction)
- ☐ 10. Transportation
- ☐ 11. Communications
- ☐ 12. Technological development
- ☐ 13. Space
- ☐ 14. Business/commerce
- ☐ 15. None of the above

18. Please indicate from the list below the **ONE** energy source that involves the **LARGEST** proportion of your energy-related work during a typical week; if **NONE**, check #1.

- ☐ 1. No energy-related activity
- ☐ 2. Coal and coal products
- ☐ 3. Petroleum (including oil shale and tar sands) or natural gas
- ☐ 4. Fission
- ☐ 5. Fusion
- ☐ 6. Hydroenergy
- ☐ 7. Direct solar (including space and water heating, thermal, electric)
- ☐ 8. Indirect solar (winds, tides, biomass, etc.)
- ☐ 9. Geothermal
- ☐ 10. Other, please specify ______________________

19. From the list below, indicate the **ONE** energy-related activity to which you would be **MOST** interested in devoting your future professional time; if **NONE**, check #1.

- ☐ 1. No energy-related activity
- ☐ 2. Exploration
- ☐ 3. Extraction (gas, oil, mining)
- ☐ 4. Manufacture of energy-related components or products
- ☐ 5. Fuel processing (including refining and enriching)
- ☐ 6. Electric power generation
- ☐ 7. Transportation, transmission, distribution of fuel or energy
- ☐ 8. Energy storage
- ☐ 9. Energy utilization, management
- ☐ 10. Fuel reprocessing or disposal
- ☐ 11. Energy conservation
- ☐ 12. Environmental impact (health, economic, etc.)
- ☐ 13. Education, training
- ☐ 14. Other, please specify ______________________

(please continue)

20. Is any of the work in which you were engaged **during the past year** supported by U.S. Government funds?

☐ 1. Yes
☐ 2. No
☐ 3. Don't know

a. If **YES**, which federal agencies or departments are supporting your work? (Check all that apply.)

☐ 1. Agency for International Development
☐ 2. Department of Agriculture
☐ 3. Department of Commerce
☐ 4. Department of Defense
☐ 5. Department of Energy
☐ 6. Department of Education (including NIE, NCES)
☐ 7. Department of Health and Human Services (including NIH)
☐ 8. Department of Housing and Urban Development
☐ 9. Department of the Interior
☐ 10. Department of Justice
☐ 11. Department of Labor
☐ 12. Department of Transportation
☐ 13. Environmental Protection Agency
☐ 14. National Aeronautics and Space Administration
☐ 15. National Science Foundation
☐ 16. Nuclear Regulatory Commission
☐ 17. Other, please specify
☐ 18. Don't know source agency

IV. ASSESSMENT OF DOE RESEARCH PARTICIPATION PROGRAMS

21. To what extent did your participation in a research participation program influence your decision on the following: (Circle the number that corresponds to your response for each item.)

	Not At All	Small Extent	Some Extent	Large Extent
a. Whether to attend graduate school	1	2	3	4
b. Your choice of graduate school	1	2	3	4
c. Your area of specialization	1	2	3	4
d. The level of your final degree	1	2	3	4
e. Your current occupation	1	2	3	4
f. Your current employer	1	2	3	4
g. Your current and past research activities	1	2	3	4

(please continue)

22. Which of the following were part of a DOE research participation program in which you participated? (Check all that apply.)

- ☐ 1. Assistance with housing arrangements
- ☐ 2. Opportunity to meet with other participants on a regular basis
- ☐ 3. Organized social activities for research participation program participants
- ☐ 4. A formal series of lectures or seminars
- ☐ 5. Participation in an ongoing research project
- ☐ 6. Opportunity to work as part of a research team
- ☐ 7. Training in the use of sophisticated equipment and instrumentation
- ☐ 8. A formal presentation of your research to laboratory staff
- ☐ 9. Preparation of a paper based on your research
- ☐ 10. Academic credit for participation
- ☐ 11. Frequent (at least once a week) interaction with your supervisor/mentor
- ☐ 12. Contact with supervisor or research colleagues maintained after the program ended

23. On a scale of 1 to 10, with 1 representing very dissatisfied and 10 representing very satisfied, how would you rate your overall experience in a DOE research participation program? ______

24. Have you participated in any subsequent U.S. Department of Energy programs?

- ☐ 1. Yes, please specify ____________________
- ☐ 2. No

25. Are there any other direct or indirect consequences of your DOE research participation program appointment on your career? Please explain.

____
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1995

DEGREE AND EMPLOYMENT SPECIALTY LIST

Agriculture

804 Agriculture, business
013 Agronomy
014 Animal, dairy, poultry sciences
015 Farm and range management
016 Fish, game, and wildlife management
017 Food sciences
018 Forestry and related sciences
019 Horticulture
020 Natural resources management
021 Soil science
090 Agricultural sciences, other*

Biological Sciences

211 Anatomy, histology
213 Biochemistry
714 Biometrics and biostatistics
214 Biophysics
215 Botany
221 Cell and molecular biology
216 Entomology
226 Embryology
217 Genetics
218 Immunology
219 Marine biology
220 Microbiology, bacteriology
227 Neurosciences
222 Nutrition
228 Parasitology
223 Pathology, human, animal, plant
224 Physiology, human, animal, plant
229 Radiology
230 Toxicology
225 Zoology
290 Biological sciences, other*

Education

413 Biological sciences education
414 Engineering education
417 Mathematics education
421 Physical sciences education
425 Social science education
490 Education, other*

Engineering

511 Aerospace, aeronautical, astronautical
512 Agricultural
513 Architectural
514 Bioengineering and biomedical engineering
515 Chemical, including petroleum refining
516 Civil, construction, and transportation
729 Computer
517 Electrical, electronic, and communication
529 Engineering science, mechanics, physics
519 Environmental and sanitary
520 Geological
521 Industrial
530 Materials
522 Mechanical
523 Metallurgical
524 Mining and mineral
525 Naval architecture and marine
526 Nuclear
531 Ocean
527 Petroleum
528 Textile
751 Operations research/management sciences
590 Engineering, other*

Mathematical Sciences

711 Actuarial science
712 Applied mathematics
750 Mathematics
751 Operations research/management sciences
713 Statistics
714 Biometrics and biostatistics
780 Mathematics, other*

Computer and Information Sciences

723 Software systems
724 Hardware systems
725 Intelligent systems
726 Information sciences
727 Systems analysis
728 Computer sciences, other

Physical Sciences

720 Astronomy
721 Atmospheric sciences and meteorology
213 Biochemistry
722 Chemistry
741 Earth sciences and geology
733 Metallurgy
742 Oceanography
731 Physics
790 Physical sciences, other*

Social Sciences

811 Anthropology
812 Criminology
813 Economics (except agricultural)
814 Geography
823 Economics, agricultural
118 Linguistics
817 Political science and government
818 Psychology (except clinical)
821 Sociology
822 Urban studies
890 Social sciences, other*

Health Sciences

611 Clinical psychology
612 Dentistry
614 Hospital and health care administration
615 Medicine or premedicine
616 Nursing
617 Pharmacology
618 Pharmacy
690 Health area, other*

Arts, Humanities and Other Specialties

910 Area and ethnic studies
911 Architecture and environmental design
110 Arts and letters, general
310 Business and commerce
115 English and journalism
114 Fine and applied arts
116 Foreign language and literature, all fields
815 History
912 Home economics, all fields
913 Law and prelaw
914 Library science
915 Military science, including merchant marine deck officer
816 Philosophy
819 Religion and theology
820 Social work
999 Other specialties*

*Identify specific field in space provided in the questionnaire.

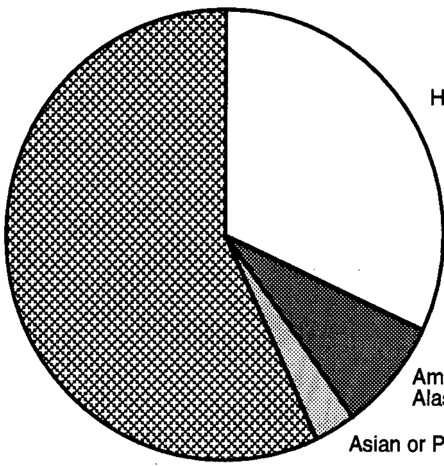
1995

Appendix B
Profile of Survey Respondents

Characteristics of Respondents
The 65 respondents to the survey questionnaire ranged from 20 years to 41 years of age with an average age of 26. There were slightly more males than females (52 percent versus 48 percent), and the majority of the respondents were Black (57 percent). Most of the respondents were U. S. citizens (95 percent).

Race/Ethnicity of Survey Respondents

(n=65)



Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

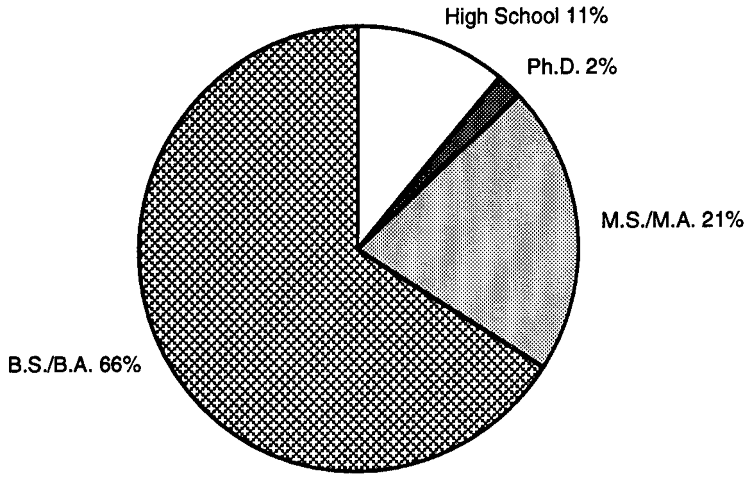
The respondents had participated in DOE programs at more than a dozen sites, with the larger proportions representing programs at Argonne National Laboratory (17 percent), Los Alamos National Laboratory (17 percent), and Fermi National Accelerator Laboratory (15 percent). In addition, about 14 percent of the respondents indicated they had spent multiple years in DOE research participation programs. Most of the respondents (80 percent) had participated in 1992, 1993, or 1994. The Undergraduate and Graduate Student Research Participation programs and the Science and Engineering Research Semester each accounted for about one-third of the respondents with a small number in the Laboratory Graduate Research Participation program, a thesis/ dissertation research program.

Educational Attainment of Respondents

Since the majority of respondents were participants in undergraduate programs over the past three years, it is not surprising that less than one-fourth had earned graduate degrees at the time of the survey. The respondents reported their highest degrees were earned at 43 campuses (see Appendix C for list of institutions).

Level of Highest Degree of Survey Respondents

(n=62)

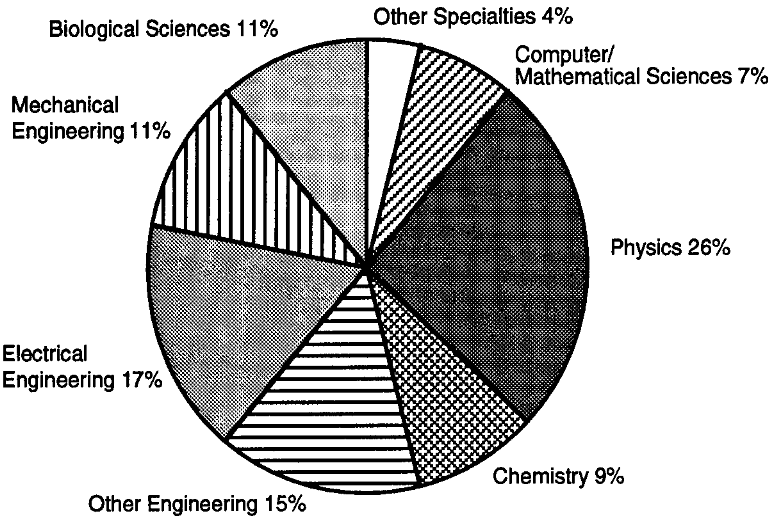


Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

More than one-fourth of the bachelor's degrees were earned in physics, followed by 17 percent in electrical engineering and 11 percent each in mechanical engineering and in biological sciences combined. All engineering degrees comprised 43 percent of the undergraduate degrees. Almost all of the reported bachelor's degrees were in natural sciences and engineering (96 percent).

Bachelor's Degree Field of Survey Respondents

(n=54)



Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Of the 14 master's degree fields reported, the largest proportion were in physics (43 percent), followed by chemistry, electrical engineering, and mechanical engineering with 14 percent each. The two doctorate degrees reported were both in physics.

Almost 90 percent of the respondents did not expect the degree they currently held to be their final degree. Of those expecting to receive additional degrees, 60 percent expected to earn a Ph.D., with an additional 9 percent expecting to earn a professional degree. These expectations are very consistent with larger groups of former SERS participants. (See *U.S. Department of Energy Science and Engineering Research Semester: Profile and Survey of 1987-1990 SERS Participants*, July 1991.)

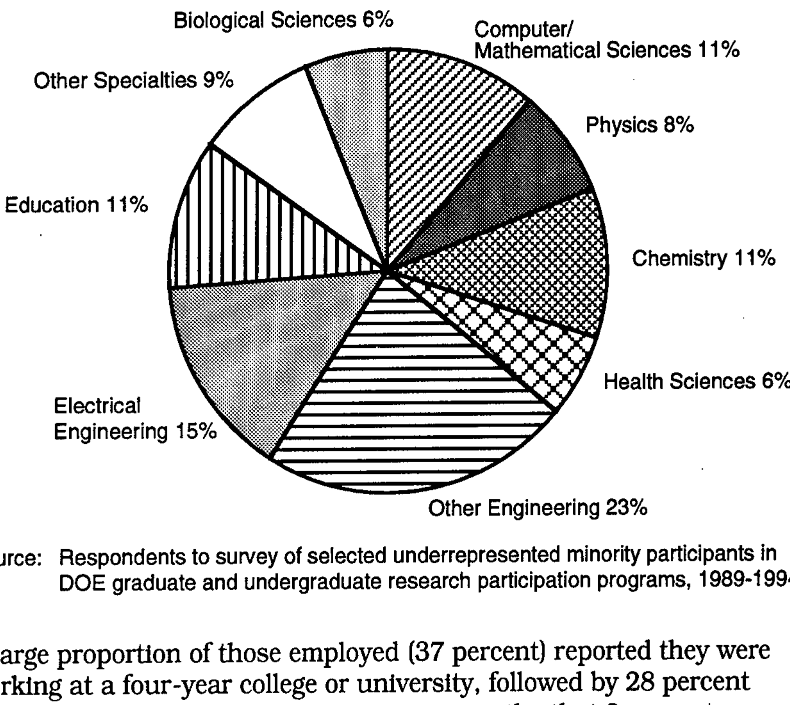
Employment

Only 29 percent of the respondents reported full-time employment, which is not surprising considering their ages and where they are in terms of educational attainment. The largest proportion (44 percent) indicated they were employed part-time. One respondent reported holding a postdoctoral appointment. For those who were unemployed and employed part-time, 92 percent reported that their reason for not working full-time was that they were students.

Of the 65 respondents, 53 reported an employment specialty for their current principal employment. The largest proportion reported electrical engineering. Chemistry, education, and computer/mathematical sciences were also reported by relatively large numbers of respondents.

Current Employment Specialty of Survey Respondents

(n=53)

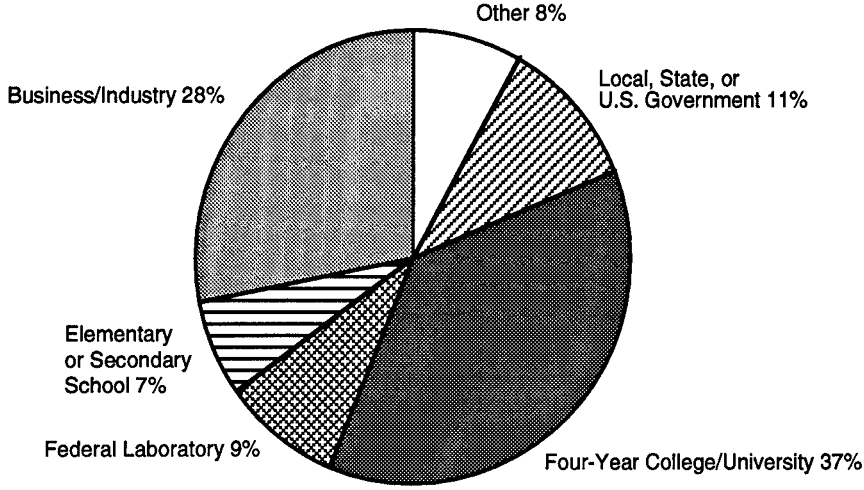


Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

A large proportion of those employed (37 percent) reported they were working at a four-year college or university, followed by 28 percent working in business or industry. It is noteworthy that 9 percent were working in federal laboratories. The proportion reported by these underrepresented minority participants is quite similar to the proportion of other former DOE SRP participants (who had participated in the undergraduate program eight years earlier) working for federal labs. (See *U.S. Department of Energy Student Research Participation Program: Profile and Follow-up of 1985 Participants*, September 1994.)

Current Principal Employer of Survey Respondents

(n=54)



Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Respondents were also asked to indicate their primary work activity and the area of national interest for their current employment. More than one-fifth were involved in applied research, with total R&D activities comprising 41 percent of the responses. In terms of non-R&D activities, the largest proportion indicated their primary work activity to be teaching (17 percent). The area of national interest also showed a large proportion involved with education (30 percent), followed by technological development and the environment.

About 22 percent of the employed respondents indicated their **current** work involved an energy source; of those, the largest number indicated solar, followed by fission. When asked which energy-related area would be of most interest in terms of **future** work, 22 percent indicated environmental impact, and an equal proportion chose no energy-related activity.

Primary Work Activity of Survey Respondents

Activity	Frequency	Percent
Applied Research	11	21
Basic Research	5	9
Development—Product/Process/Technology	5	9
Management of R&D	1	2
Subtotal of R&D	**22**	**41**
Computer Applications	4	8
Consulting	2	4
Distribution	2	4
Management—Non R&D	2	4
Quality Control, Testing, Evaluation, Inspection	5	9
Teaching	9	17
Other	7	13

Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Area of National Interest to Which Most Professional Time Devoted by Survey Respondents

Area	Frequency	Percent
Business/Commerce	2	4
Communications	3	6
Education	15	30
Energy and fuel	4	8
Environment	6	12
Health	3	6
National Defense	2	4
Technological Development	7	14
Other	8	16

Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

More than two-thirds of the employed respondents indicated their work during the past year was supported by the U.S. Government funding, with the largest proportion naming the Department of Energy as the funding agency.

Government Funding Source for Current Employment of Survey Respondents

Source	Frequency	Percent
Department of Defense	3	8
Department of Energy	24	60
Department of Education	4	10
Department of Health and Human Services	2	5
Department of Housing and Urban Development	1	3
Department of Transportation	1	3
Environmental Protection Agency	3	8
National Science Foundation	8	20
Nuclear Regulatory Commission	1	3
Other Agency or Department	1	3

Source: Respondents to survey of selected underrepresented minority participants in DOE graduate and undergraduate research participation programs, 1989-1994.

Note: These percentages are based on n=40, the number of respondents who indicated their work was supported by U.S. Government funds; in some instances, respondents were funded by more than one agency.

Appendix C

List of Institutions of Survey Respondents

Underrepresented Minorities in DOE Research Participation Programs: Institution of Highest Degree Received

Auburn University
Benedict College
California State University, Fresno
California State University, Los Angeles
California State University, Sacramento
Chicago State University (2)
Clark Atlanta University
Dillard University
Florida International University
Florida State University
Howard University
Illinois Institute of Technology (3)
Iowa State University
Lincoln University
Mississippi Valley State University
Montana State University
Morgan State University
North Carolina Agricultural and Technological State University
New York Institute of Technology
Norfolk State University
Oklahoma Panhandle State University
Prairie View A&M University (2)
Saint Mary's College
San Jose State University
Smith University
Sojourner-Douglass College
Southern University
Tuskegee University
University of California at Berkeley
University of California at Davis
University of Delaware
University of Illinois at Chicago
University of Illinois at Urbana-Champaign(2)
University of Miami/Barry University
University of Michigan
University of Puerto Rico (5)
University of Puerto Rico, Mayaguez Campus
University of Southern Colorado
University of Texas at Austin
University of South Dakota
Virginia State University (2)
Weber State University
Xavier University of Louisiana (2)

Appendix D

Open-Ended Comments of Survey Respondents

Are there any other direct or indirect consequences of your DOE research participation program appointment on your career? Please explain.

Educational Attainment

"I already have a M.S. in environmental sciences/occupational safety and health."

"The main consequence was that it shows me the importance of having an advanced degree."

"Yes, I am currently working on my master's project. It involves developing gears using two different computer-aided design software."

"Entering the undergraduate research program at the university."

"Likely variable involved in admission to graduate school."

"Above all, my research participation has confirmed my desire to continue my education. It has exposed me to a level of advanced research and development that has inspired me to want to one day join a team such as the one I worked with. I have gained a confidence that I never had before in believing that I can work toward a goal and one day achieve it. It has also taught me about teamwork and its importance. I am definitely a more mature and inspired person than I was before I joined the program, and I'm grateful for the opportunities given to me and the knowledge I have gained. I intend to make the best of it."

"Since my completion at a DOE laboratory, I have been participating in a doctoral program in pharmacology at Howard University. I am completing my second year. This summer I will be conducting experiments at the Cancer Center of Howard University Hospital. I fully support DOE research programs, particularly DOE programs geared toward educating minorities."

"My participation in DOE research programs has served to strengthen my determination to go on to graduate school to obtain a master's and Ph.D."

"If the government/DOE programs are going to fund a student, be sure that student finishes school before removing the program, or get him/her other monies to finish school."

"My experience with DOE and LANL were outstanding. It has helped me to focus on a topic that I think I would like to conduct research in and attend school to obtain a master's degree. I am very grateful for the opportunity I received, and I'm glad other minority students will get the same ones. Keep up the good work."

Research Interest

"By participating in the summer internships sponsored by DOE, I gained a lot of knowledge involving research. It was very beneficial to have participated in these programs because I learned some research techniques, as well as confidence in physics and solid state electronics, my specialized area."

"It has made me realize that I'm more interested in applied research other than fundamental research, advantages and disadvantages of being part of a collaboration experiment. Also, it has given me the opportunity to learn and be exposed to advanced technology for nuclear physics research."

"I feel that the program did a good job at exposing me to research and how one conducts oneself in a research environment, and I feel that it would have been very helpful to my career, had I been interested in a research career. My primary realization resulting from my experience was that I was not interested in a research career."

"By participating in the program, I have been inspired to seek a Ph.D. in a biological area, so that I may continue to do research that will benefit mankind. Before attending the program, I had no real interest in research, nor did I have a complete understanding of the many areas that research contributes to."

"My participation in this program allowed me to be able to attain other research assignments during my graduate studies."

"It helped me realize that research is the area of engineering in which I want (ultimately) to work."

"Participation in the program has increased my interest in applying more computer knowledge to my field of interest. Also, this experience solidified my desire to pursue a career in cell biology and cancer research."

Career/Employment Opportunities

"I was offered a clinical research study position at Memorial Sloan-Kettering Cancer Hospital. This offer was in part due to my past cancer radiotherapy work at Brookhaven Lab in New York."

"Since I was in New York, I was able to apply for and interview for the job."

"Presently, I am an employee with the Department of Energy. My responsibilities are more managerial, but it still requires a technical knowledge of radiation. I strongly advise any student to pursue these programs offered by DOE. It can open many doors that you never thought would open."

"In principal, this should assist me in the job search, which I will undertake very shortly."

"Surely my participation in the DOE research participation program appointment will be a positive experience, which will make my job hunting easier when I graduate."

"Helped me get my present job as system engineer."

"I learned that large funding cuts are occurring in government laboratories and now realize that if I obtain a Ph.D., I will probably have to work in the private sector or at a university."

"Get students involved at sophomore level so that they can alter career paths if they are influenced through participation in research."

"As a result of my participation in the DOE research program, I was selected over other applicants to work at the Department of Environmental Quality with the Toxic Release Inventory (TRI) program. I'm also serving on the TRI task force."

"Having worked on the project at FermiLab gave me the insight to make a career change from physics to education. My volunteer work at the science center at FermiLab was the best experience I had there. I feel that the programs should be opened up to include interns for outreach centers at major labs."

"My work at AMES lab has allowed me to develop myself as an independent scientist."

"Potential of permanent position with FermiLab."

"There are several important consequences of my participation in the SERS program. A personal consequence is that I married a participant student and we are happy. Professional consequences include the fact that when searching for employment, I can include my experience with DOE as an important part of my technical and professional goals and expectations got more defined and higher. In terms of my personal desire not to just get a job, but to be part of a professional and talented team, oriented to development/research activities for the benefit of the society. (These were my original goals before my DOE experiences, but they got stronger after then)."

Networking

"DOE research allowed me to have exposure to people and fields I would probably not have seen otherwise. I truly look back with great appreciation!"

"Additionally, the contacts that I made during my two-year assignment were insurmountable. So much so, that the value of the knowledge gained from meeting new people outweighed the monetary award."

"While researching at the Oak Ridge National Laboratory I was able to do several things: meet highly esteemed scientists in the area of health physics, attend a radiation dosimetry conference, complete a research project (thesis) that was used to enhance Martin Marietta Energy Systems (MMES) dosimetry program, present a paper at the Black Executive Exchange Program (BEEP) conference, attend training courses related to health physics and radiation protection, represent MMES at the Women in Science conference, receive recognition for receiving a DOE fellowship, and secure a full-time position in radioactive waste management with MMES. These are just some of the major events that happened. There were several other things that I experienced as a result of receiving the fellowship. As I mentioned earlier, the most valuable consequence of receiving the DOE Research Participation Program Fellowship was the networking. As a result of networking, I received valuable insight into the world of health physics that I would have not otherwise received. By participating in research at a world-class national laboratory, I received several interviews for companies across the country. Several of the interviews turned into full-time offers. My acceptance of MMES offer stemmed from my extensive knowledge of health physics through my thesis and training classes. If it were not for the two-week training course in health physics, I was headed for a career in fiber optics. After attending the course, I was thoroughly in awe of all that health physics could offer. That was my determining factor to concentrate my studies in an environmental area."

"It facilitated contacts with other people interested in my field of research."

Mentorship

"I received very little support and encouragement. My immediate manager quit during the first year of my research. I was rather glad that he did because I was tired of his insults. He provided me with data, but very little direction; therefore, my advisor from school and I developed my plan of attack. Upon completion of my research and paper (after providing at least two or three rough drafts) when I submitted my final paper, then I received input. The input was negative, but by that time I was scheduled for defense at school in which my thesis committee was very supportive and satisfied with my paper and research. I have seven years of experience in private industry in which I enjoyed and received superior performance reviews. My experience was not very positive."

"Yes. From my experience, I learned that supervisors must be accountable to group leaders about how the graduate student is being treated."

"Yes, because my supervisor was very hostile to my presence (I feel it was a racial matter.) I have not been able to find employment in my field (my grades are good). I feel that minorities were punished in general, and I would not recommend the program to anyone. I have been forced to change fields. Currently I am pursuing my MS in technical communication at IIT (4.0/4.0). I love physics, but as I cannot even get a lab job, I have left the field."

"Supervisors have been pleased with my ability to handle multiple projects, work with diverse groups in team activities, and manage resources. There were all skills which I gained and refined while participating in the program."

General

"As a recipient of the DOE research participation program, I received paid tuition, a stipend, and an opportunity to work in a national lab."

"Yes, however, I will say that the consequences are no wise negative. I would like to commend the program on its success. It has given me a chance to succeed."

"This was a great opportunity. Now when I apply for a job, the participation in the program impresses them. I learned a lot on my own at the program, but I believe that I would have benefited more if we had been part of an actual research team. I felt isolated. I was given an opportunity, and I worked very hard. The technology that was available to me there was not available at my university. I believe that I did a great presentation and that I learned a lot in the process."

"I am very honored to have been accepted to participate in two summer research programs sponsored by DOE. (Please, continue to assist students with fulfilling their goals to become scientists for the future!)"

"Thank you for the opportunity to interact with top notch scientists at a world class lab, on a state-of-the-art, cutting-edge project."

"It taught me how to integrate human and technological resources."

"What a great opportunity!"

"I've recommended the SREL undergraduate program to many undergraduates where I now teach."

No Influence on Goals

"I don't know how association with DOE will indirectly affect my career?"

"No. DOE did not influence my decision on attending graduate school. My appointment at ANL was during a time at which I was considering going to medical school. My experience prior to my being at ANL is what influenced my decision to continue my education in polymer chemistry and science."

Appendix E
Request for Nominations

FROM: Frank M. Vivio, Argonne National Laboratory — Fax #: (708) 252-3193, Tel #: (708) 252-3376

SUBJECT: DOE Underrepresented Populations Group Study

MESSAGE: As you know, Argonne National Laboratory (ANL) and Oak Ridge Institute for Science and Education (ORISE) have collaborated for ten years to collect and analyze data from participants in a variety of educational programs sponsored by the U.S. Department of Energy's Office of Science Education and Technical Information. The data demonstrate that the programs stimulate interest in pursuing energy-related careers in science, engineering, and other technical areas. How the programs can most effectively serve this function for African-, Hispanic, and Native American groups is the focus of ANL/ORISE analysis for FY 1995.

In support of this effort, we would appreciate your assistance in identifying past participants from underrepresented racial and ethnic groups who can help with this assignment. During the next few months, meetings will be two DOE program areas: undergraduate research participation programs, and (2) graduate student research participation programs.

We ask that you nominate a few past participants in your DOE programs for undergraduate and graduate students who you feel are in a position to provide perceptive, articulate insights into the program experiences of underrepresented groups at your facility. From Ames Laboratory, we would like the following representation: four (4) minority males who participated in the Graduate Student Research Participation (GSRP) program at your facility within the past five years. Please complete and return, by Fax, the Nomination Forms provided on or before November 18, 1994, in order that we may make a selection of participants for this study.

We appreciate your assistance in our effects to determine how best to recruit participants from underrepresented groups, how to design program delivery systems to have the greatest impact on those who participate, and how to retain them for the long term in scientific and technical career tracks. The information will be useful to all of us as we continue to manage DOE educational programs.

FMV/cir
attachment: Nomination Forms

NOMINATION FORM
DOE Underrepresented Populations Focus Group Study

Submitted by:

Name of Nominee #1: ______________________________

Program: **Science and Engineering Research Semester** Year of Participation: 1989 1990 1991 1992 1993 1994

Racial Background: ☐ *African-American* Supervisor: ______________________________

☐ *Hispanic-American*

☐ *Native-American* Gender: **Male**

Telephone: ______________________________

Address: ______________________________

____

____

____

Institutional Affiliation: ______________________________

Name of Nominee #2: ______________________________

Program: **Undergraduate Student Research Participation** Year of Participation: 1989 1990 1991 1992 1993 1994

Racial Background: ☐ *African-American* Supervisor: ______________________________

☐ *Hispanic-American*

☐ *Native-American* Gender: **Male**

Telephone: ______________________________

Address: ______________________________

____

____

____

Institutional Affiliation: ______________________________

Name of Nominee #3: ______________________________

Program: **Undergraduate Student Research Participation** Year of Participation: 1989 1990 1991 1992 1993 1994

Racial Background: ☐ *African-American* Supervisor: ______________________________

☐ *Hispanic-American*

☐ *Native-American* Gender: **Female**

Telephone: ______________________________

Address: ______________________________

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____

Institutional Affiliation: ______________________________

Appendix F
Critical Incident Technique

Critical Incident Form	Participant # ________
1. Describe what led up to the situation.	
2. What did the individual or organization do (or not do) that had a positive or negative effect?	

Critical Incident Form – continued

3. What was the outcome or result of this action?

4. Circle the number below that best summarizes the degree to which the action had a positive or negative effect.

-3	-2	-1	0	+1	+2	+3
Very Negative			No Effect			Very Positive

5. Why did you give the action the rating you did?
Do you think anything should have been done differently? If so, what?

Participant Consent Form

As you may know the Argonne National Laboratory and the Oak Ridge Institute for Science and Education are using a number of methods to evaluate Department of Energy educational programs. By participating in this study, you will be helping us to identify factors that encourage persistence in acquiring advanced degrees in science and engineering.

This workshop will take approximately 3 1/2 hours. We will ask you to describe incidents that you have observed relating to your experience in these educational programs.

Your participation is completely voluntary. You may stop at any time. You do not have to respond to any question you do not want to answer. Any responses you provide will be separated from your name. They will be reviewed only by authorized people who are involved in this study.

If you agree to help us, please sign below. Even if you sign this form, you can stop participating whenever you want.

________________________________ ____________

(Signature) *(Date)*

____

(Printed Name)

Appendix G
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